

## WHAT IS CLAIMED IS:

1. An electronic package having contacts adapted to be attached to a substrate, said electronic package comprising:
  - at least one electronic device, said electronic device having a plurality of contacts thereon;
  - 5 a solderable flexible adhesive interposer including:
    - at least one layer of flexible dielectric adhesive having a modulus of elasticity less than about 35,000 kg/cm<sup>2</sup> (about 500,000 psi),
    - 10 a plurality of conductive vias through said layer of flexible dielectric adhesive, said plurality of conductive vias being of a flexible electrically conductive adhesive having a modulus of elasticity less than about 35,000 kg/cm<sup>2</sup> (about 500,000 psi) and being in a pattern corresponding to a pattern of contacts of one of said electronic device and a substrate, and
    - 15 a solderable electrically conductive metal formed on at least one exposed surface of said conductive vias and in electrical contact therewith,
    - wherein at least one end of the plurality of conductive vias includes contacts adapted to be attached to a substrate; and
    - 20 means for connecting the contacts of said electronic device to said conductive vias.
2. The electronic package of claim 1 wherein said means for connecting includes connections of one of solder and electrically-conductive adhesive joining proximate corresponding ones of said conductive vias to the contacts of said electronic device.

3. The electronic package of claim 1 wherein said plurality of conductive vias are in a pattern corresponding to the pattern of contacts of said electronic device, said solderable flexible adhesive interposer further comprising patterned metal conductors on one surface of said layer of flexible dielectric adhesive fanning out from at least ones of said conductive vias to locations corresponding to the pattern of contacts of the substrate.
4. The electronic package of claim 1 wherein said plurality of conductive vias are in a pattern corresponding to the pattern of contacts of the substrate, said solderable flexible adhesive interposer further comprising patterned metal conductors on one surface of said layer of flexible dielectric adhesive fanning out from at least ones of said conductive vias to locations corresponding to the pattern of contacts of said electronic device.
5. The electronic package of claim 4 wherein said electronic device is attached to said solderable flexible adhesive interposer with its contacts distal therefrom, and wherein said means for connecting includes wires bonded between the contacts of said electronic device and ones of said conductive vias.
6. The electronic package of claim 1 further comprising a protective enclosure surrounding said electronic device, wherein said protective enclosure is one of a cover attached at its edges to the periphery of said solderable flexible adhesive interposer and an encapsulant surrounding said electronic device and bonded to said solderable flexible adhesive interposer at least along the periphery thereof.
7. The electronic package of claim 6 wherein said protective enclosure includes a cover attached at its edges to the periphery of said solderable flexible adhesive interposer and attached by a flexible adhesive to a surface of said electronic device distal said solderable flexible adhesive interposer.

8. The electronic package of claim 1 wherein at least one of said flexible dielectric adhesive and said flexible conductive adhesive has a modulus of elasticity less than about  $7,000 \text{ kg/cm}^2$  (about 100,000 psi).
9. The electronic package of claim 1 wherein at least one of said flexible dielectric adhesive and said flexible conductive adhesive has a modulus of elasticity less than about  $1,400 \text{ kg/cm}^2$  (about 20,000 psi).
10. The electronic package of claim 1 wherein said solderable electrically conductive metal is selected from the group consisting of copper, nickel, tin, lead, indium, silver, gold, palladium, platinum, nickel-gold, nickel-palladium, platinum, combinations thereof, and alloys thereof.
11. The electronic package of claim 1 further comprising an underfill adhesive bonding said electronic device and said flexible dielectric adhesive interposer.
12. The electronic package of claim 11 wherein said underfill adhesive includes flexible dielectric adhesive having a modulus of elasticity less than about  $35,000 \text{ kg/cm}^2$  (about 500,000 psi).
13. The electronic package of claim 1 wherein said flexible conductive adhesive is one of a thermosetting adhesive and a thermoplastic adhesive having a melt flow temperature that exceeds the melting temperature of solder.
14. The electronic package of claim 1 in combination with a substrate having a plurality of substrate contacts thereon in a pattern corresponding to at least ones of the conductive vias of said solderable flexible adhesive interposer, and second means for connecting the ones of the conductive vias of said solderable flexible adhesive interposer to corresponding contacts of said substrate.

15. The electronic package of claim 14 wherein said second means for connecting includes connections of one of solder and electrically-conductive adhesive joining proximate corresponding ones of said conductive vias to the contacts of said substrate.
16. A solderable flexible adhesive interposer comprising:
- at least one layer of flexible dielectric adhesive having a modulus of elasticity less than about 35,000 kg/cm<sup>2</sup> (about 500,000 psi),
- a plurality of conductive vias through said layer of flexible dielectric adhesive, said plurality of conductive vias being of a flexible electrically conductive adhesive having a modulus of elasticity less than about 35,000 kg/cm<sup>2</sup> (about 500,000 psi) and being in a pattern adapted for connection to contacts of one of an electronic device and a substrate, and
- a solderable electrically conductive metal formed on at least one exposed surface of said conductive vias and in electrical contact therewith,
- wherein at least one end of the plurality of conductive vias includes contacts adapted to be soldered to one of an electronic device and a substrate.
17. The solderable flexible adhesive interposer of claim 16 wherein said plurality of conductive vias are in a pattern corresponding to a pattern of contacts of one of an electronic device and a substrate, said solderable flexible adhesive interposer further comprising patterned metal conductors on one surface of said layer of flexible dielectric adhesive fanning out from at least ones of said conductive vias to locations corresponding to the pattern of contacts of the other one of an electronic device and a substrate.
18. The solderable flexible adhesive interposer of claim 16 wherein at least one of said flexible dielectric adhesive and said flexible conductive adhesive has a modulus of elasticity less than about 7,000 kg/cm<sup>2</sup> (about 100,000 psi).

19. The solderable flexible adhesive interposer of claim 16 wherein at least one of said flexible dielectric adhesive and said flexible conductive adhesive has a modulus of elasticity less than about 1,400 kg/cm<sup>2</sup> (about 20,000 psi).
20. The solderable flexible adhesive interposer of claim 16 wherein said solderable electrically conductive metal is selected from the group consisting of copper, nickel, tin, lead, indium, silver, gold, palladium, platinum, nickel-gold, nickel-palladium, platinum, combinations thereof, and alloys thereof.
21. The solderable flexible adhesive interposer of claim 16 wherein said flexible conductive adhesive is one of a thermosetting adhesive and a thermoplastic adhesive having a melt flow temperature that exceeds the melting temperature of solder.
22. The solderable flexible adhesive interposer of claim 16 in combination with at least one electronic device having a plurality of contacts thereon connected by one of solder and electrically conductive adhesive to at least certain ones of said conductive vias of said solderable flexible adhesive interposer.

23. A solderable flexible adhesive interposer comprising:

a plurality of layers of flexible dielectric adhesive having a modulus of elasticity less than about  $35,000 \text{ kg/cm}^2$  (about 500,000 psi);

5 a plurality of conductive vias through each of said layers of flexible dielectric adhesive, said plurality of conductive vias being of a flexible electrically conductive adhesive having a modulus of elasticity less than about  $35,000 \text{ kg/cm}^2$  (about 500,000 psi), said conductive vias in an exposed one of said plurality of flexible dielectric adhesive layers being in a pattern adapted for connection to contacts of one of an electronic device and a substrate;

10 a solderable electrically conductive metal formed on an exposed surface of said conductive vias of the exposed one of said flexible dielectric adhesive layers and in electrical contact therewith, wherein at least one end of the plurality of conductive vias includes contacts adapted to be soldered to one of an electronic device and a substrate;

15 said plurality of conductive vias in each said layer of flexible dielectric adhesive being in a pattern corresponding at least in part to a pattern of said plurality of conductive vias of the adjacent layers of said flexible dielectric adhesive; and

20 a conductor residing between at least two of said adjacent layers of flexible dielectric adhesive, wherein said conductor is patterned and is in electrical contact with ones of said conductive vias of each of the at least two of said layers of flexible dielectric adhesive.

24. The solderable flexible adhesive interposer of claim 23 wherein said conductive vias of the exposed flexible dielectric adhesive layer are in a pattern corresponding to a pattern of contacts of one of an electronic device and a substrate, said solderable flexible adhesive interposer further comprising patterned metal conductors on a surface of another of said layers of flexible dielectric adhesive fanning out from at least ones of said conductive vias to locations corresponding to the pattern of contacts of the other one of an electronic device and a substrate.

25. The solderable flexible adhesive interposer of claim 23 wherein at least one of said flexible dielectric adhesive and said flexible conductive adhesive has a modulus of elasticity less than about 7,000 kg/cm<sup>2</sup> (about 100,000 psi).
26. The solderable flexible adhesive interposer of claim 23 wherein at least one of said flexible dielectric adhesive and said flexible conductive adhesive has a modulus of elasticity less than about 1,400 kg/cm<sup>2</sup> (about 20,000 psi).
27. The solderable flexible adhesive interposer of claim 23 wherein said solderable electrically conductive metal is selected from the group consisting of copper, nickel, tin, lead, indium, silver, gold, palladium, platinum, nickel-gold, nickel-palladium, platinum, combinations thereof, and alloys thereof.
28. The solderable flexible adhesive interposer of claim 23 wherein said flexible conductive adhesive is one of a thermosetting adhesive and a thermoplastic adhesive having a melt flow temperature that exceeds the melting temperature of solder.
29. The solderable flexible adhesive interposer of claim 23 in combination with at least one electronic device having a plurality of contacts thereon connected by one of solder and electrically conductive adhesive to at least certain ones of said conductive vias of a first of said plurality of layers of flexible dielectric adhesive.

30. A panel of a plurality of electronic devices having a pattern of contacts thereon and solderable flexible adhesive connections formed on the contacts comprising:

5 a layer of an oxidation-resistant metal on the contacts of the electronic devices of said panel;

10 a plurality of electrically conductive bumps formed of a flexible electrically conductive adhesive having a modulus of elasticity less than about 35,000 kg/cm<sup>2</sup> (about 500,000 psi), wherein said plurality of bumps is deposited on the oxidation resistant layer in the pattern of contacts of the electronic device; and

a solderable electrically conductive metal layer formed on an exposed surface of said electrically conductive bumps distal the contacts of the electronic devices and in electrical contact therewith.

31. The panel of a plurality of electronic devices of claim 30 wherein said panel includes one of a semiconductor wafer having a plurality of semiconductor devices formed therein and a panel of electrical substrates having a plurality of electrical substrates formed therein.
32. The panel of a plurality of electronic devices of claim 30 wherein said flexible conductive adhesive has a modulus of elasticity less than about 7,000 kg/cm<sup>2</sup> (about 100,000 psi).
33. The panel of a plurality of electronic devices of claim 30 wherein said flexible conductive adhesive has a modulus of elasticity less than about 1,400 kg/cm<sup>2</sup> (about 20,000 psi).



34. The panel of a plurality of electronic devices of claim 30 wherein said flexible conductive adhesive is one of a thermosetting adhesive and a thermoplastic adhesive having a melt flow temperature that exceeds the melting temperature of solder.
35. The panel of a plurality of electronic devices of claim 30 wherein said solderable electrically conductive metal is selected from the group consisting of copper, nickel, tin, lead, indium, silver, gold, palladium, platinum, nickel-gold, nickel-palladium, platinum, combinations thereof, and alloys thereof.
36. An electronic device having solderable flexible adhesive connections formed on the contacts thereof excised from the panel of a plurality of electronic devices of claim 30.
37. A method for making a solderable flexible adhesive interposer adapted for solder connection to an electronic device comprising:
- providing a sheet of metal foil;
  - providing at least one layer of a flexible dielectric adhesive having a modulus of elasticity less than about 35,000 kg/cm<sup>2</sup> (about 500,000 psi) on one surface of the sheet of metal foil, the layer of flexible dielectric adhesive having a plurality of via openings therein;
  - providing a plurality of bumps of flexible electrically conductive adhesive having a modulus of elasticity less than about 35,000 kg/cm<sup>2</sup> (about 500,000 psi) on the metal foil at locations of the via openings of said layer of flexible dielectric adhesive, thereby forming conductive vias therein;
  - patterning the metal foil to form a pattern of contacts electrically connected to the flexible electrically conductive adhesive conductive vias; and
  - plating a solderable metal on an exposed end of the conductive vias to provide solderable contacts.

38. The method of claim 37 wherein said providing at least one layer of flexible dielectric adhesive includes one of depositing a layer of flexible dielectric adhesive on the sheet of metal foil and laminating a sheet of flexible dielectric adhesive to the sheet of metal foil.
39. The method of claim 38 further comprising forming the via openings in the sheet of flexible dielectric adhesive one of before and after said laminating a sheet of flexible dielectric adhesive to the sheet of metal foil.
40. The method of claim 37 wherein said plating a solderable metal includes plating a metal selected from the group consisting of copper, nickel, tin, lead, indium, silver, gold, palladium, platinum, nickel-gold, nickel-palladium, combinations thereof, and alloys thereof.
41. The method of claim 37 further comprising plating an oxidation resistant metal on the metal foil at least at the locations of the via openings prior to providing bumps of flexible conductive adhesive thereon.
42. The method of claim 41 wherein said plating an oxidation resistant metal includes plating a metal selected from the group consisting of silver, gold, palladium, platinum, nickel-gold, nickel-palladium, combinations thereof, and alloys thereof.
43. The method of claim 37 further comprising plating a column of an electrically conductive metal on the plated solderable metal on the bumps of flexible conductive adhesive to increase the length of the conductive vias formed thereby.

44. The method of claim 43 wherein said plating a column of an electrically conductive metal includes plating a metal selected from the group consisting of copper, aluminum, nickel, tin, lead, indium, silver, gold, palladium, platinum, nickel-gold, nickel-palladium, combinations thereof, and alloys thereof.
45. The method of claim 44 wherein the electrically conductive metal is one of copper, aluminum, lead, indium and nickel, further comprising plating a layer of a solderable metal selected from the group consisting of tin, lead, indium, silver, gold, palladium, platinum, nickel-gold, nickel-palladium, combinations thereof, and alloys thereof.
46. The method of claim 44 further comprising providing, after said plating a column, at least a second layer of a flexible dielectric adhesive having a modulus of elasticity less than about 35,000 kg/cm<sup>2</sup> (about 500,000 psi) on the surface of the layer of flexible dielectric adhesive, the at least second layer of flexible dielectric adhesive having a plurality of via openings therein at locations corresponding to the locations of the plated columns on the bumps of flexible conductive adhesive.
47. The method of claim 37 wherein at least one of said flexible dielectric adhesive and said flexible conductive adhesive is a thermosetting adhesive, further comprising curing the at least one of said flexible dielectric adhesive and said flexible conductive adhesive prior to said patterning the metal foil.

48. A method for making a solderable electronic device on a panel of a plurality of electronic devices having a pattern of contacts thereon comprising:
- 5 providing a panel of a plurality of electronic devices having a pattern of oxidation-resistant metal contacts thereon, said panel including one of a semiconductor wafer having a plurality of semiconductor devices formed therein and a panel of electrical substrates having a plurality of electrical substrates formed therein;
- 10 forming on the oxidation-resistant metal contacts, electrically conductive bumps of a flexible electrically conductive adhesive having a modulus of elasticity less than about 35,000 kg/cm<sup>2</sup> (about 500,000 psi); and
- forming a solderable electrically conductive metal layer on an exposed surface of the electrically conductive bumps distal the contacts of the electronic devices and in electrical contact therewith through the electrically conductive bumps.
49. The method of claim 48 wherein said forming a solderable electrically conductive metal layer includes plating a solderable metal on the exposed surface of the electrically conductive bumps.
50. The method of claim 49 wherein said plating a solderable metal includes plating a metal selected from the group consisting of copper, nickel, tin, lead, indium, silver, gold, palladium, platinum, nickel-gold, nickel-palladium, combinations thereof, and alloys thereof.
51. The method of claim 48 wherein the flexible electrically conductive adhesive is a thermosetting adhesive, further comprising curing the thermosetting flexible conductive adhesive prior to said forming a solderable electrically conductive metal layer.